

FIG. 1

204290" 5844201

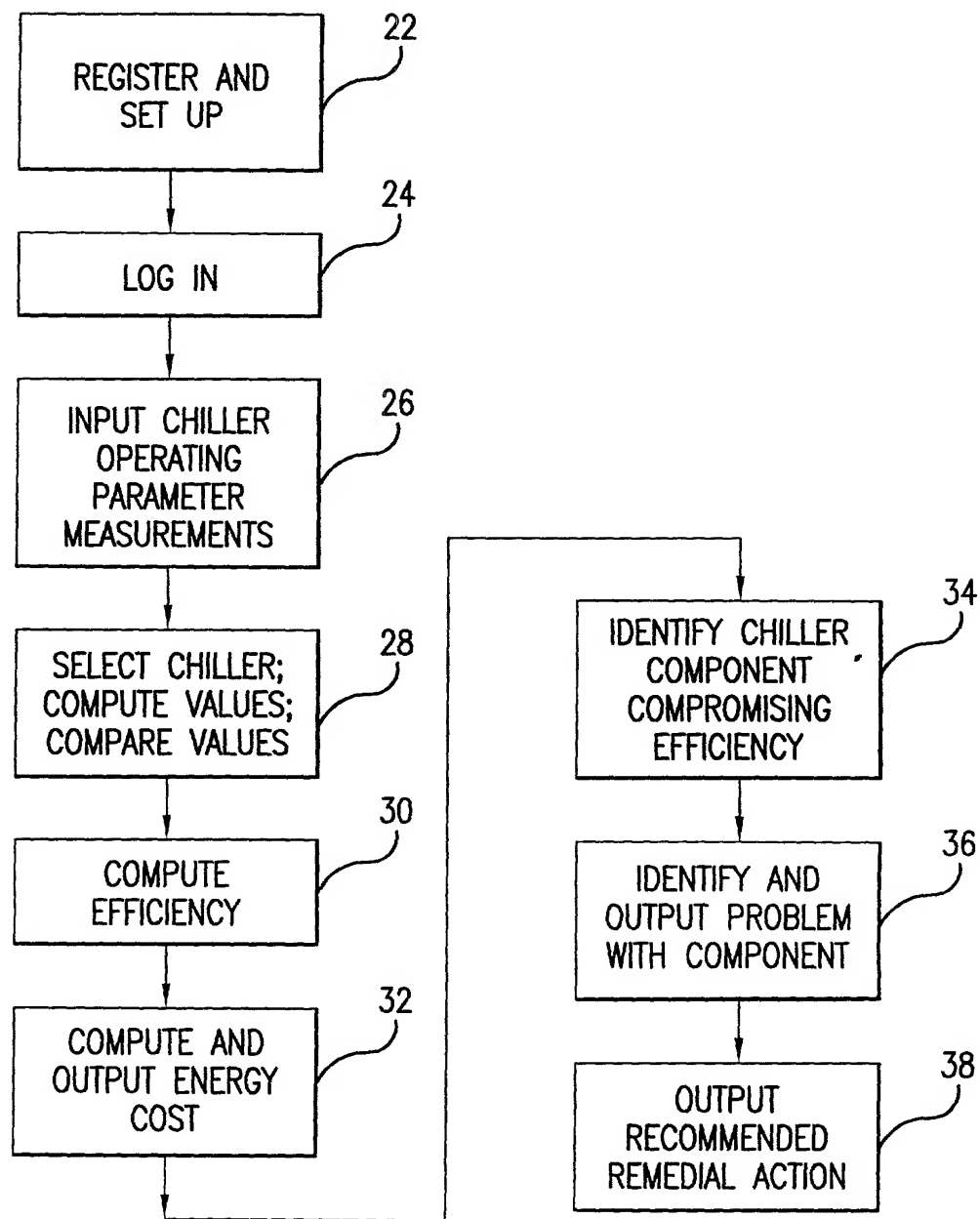


FIG.2

204290" 5844E00T

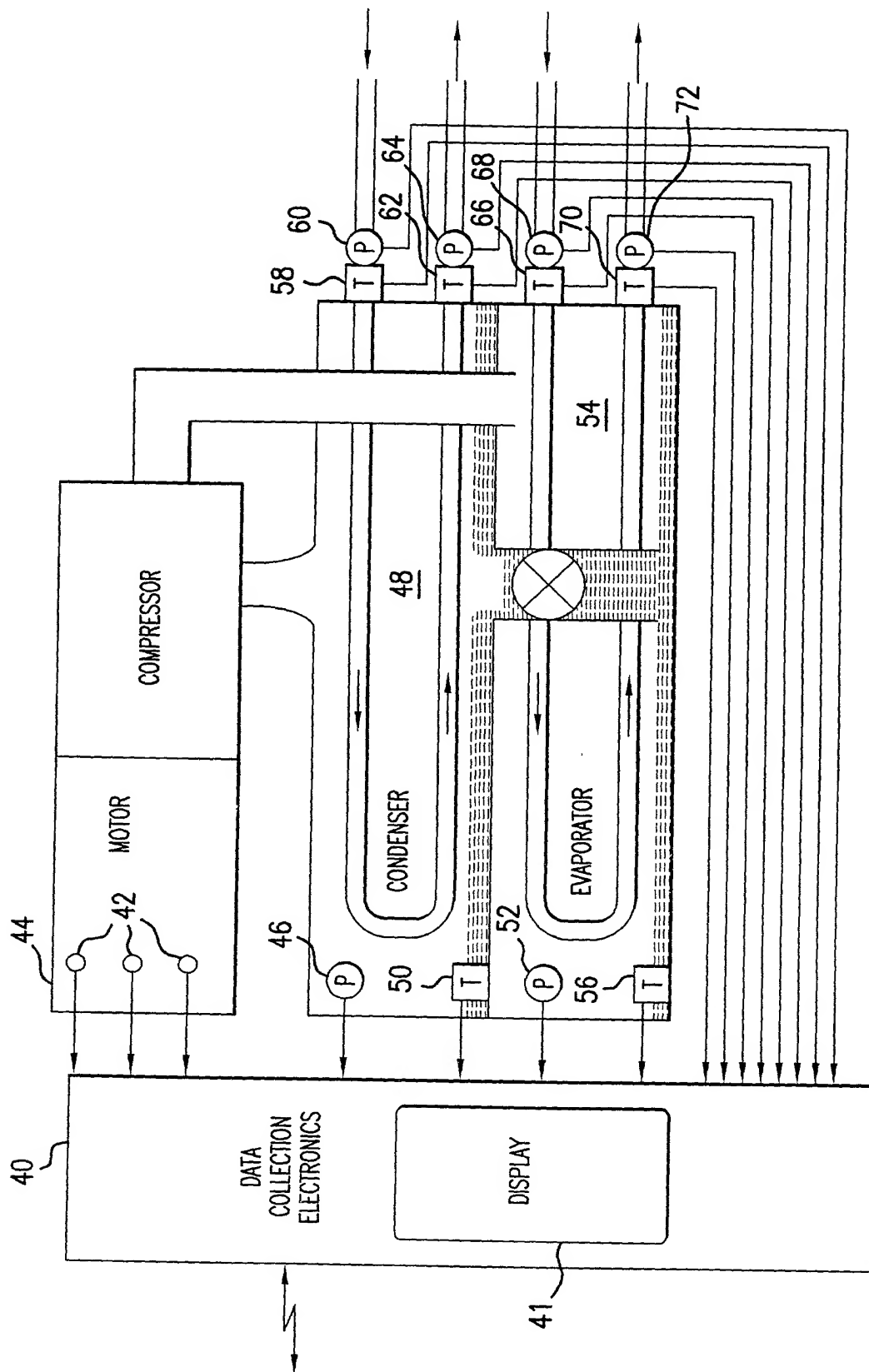


FIG.3

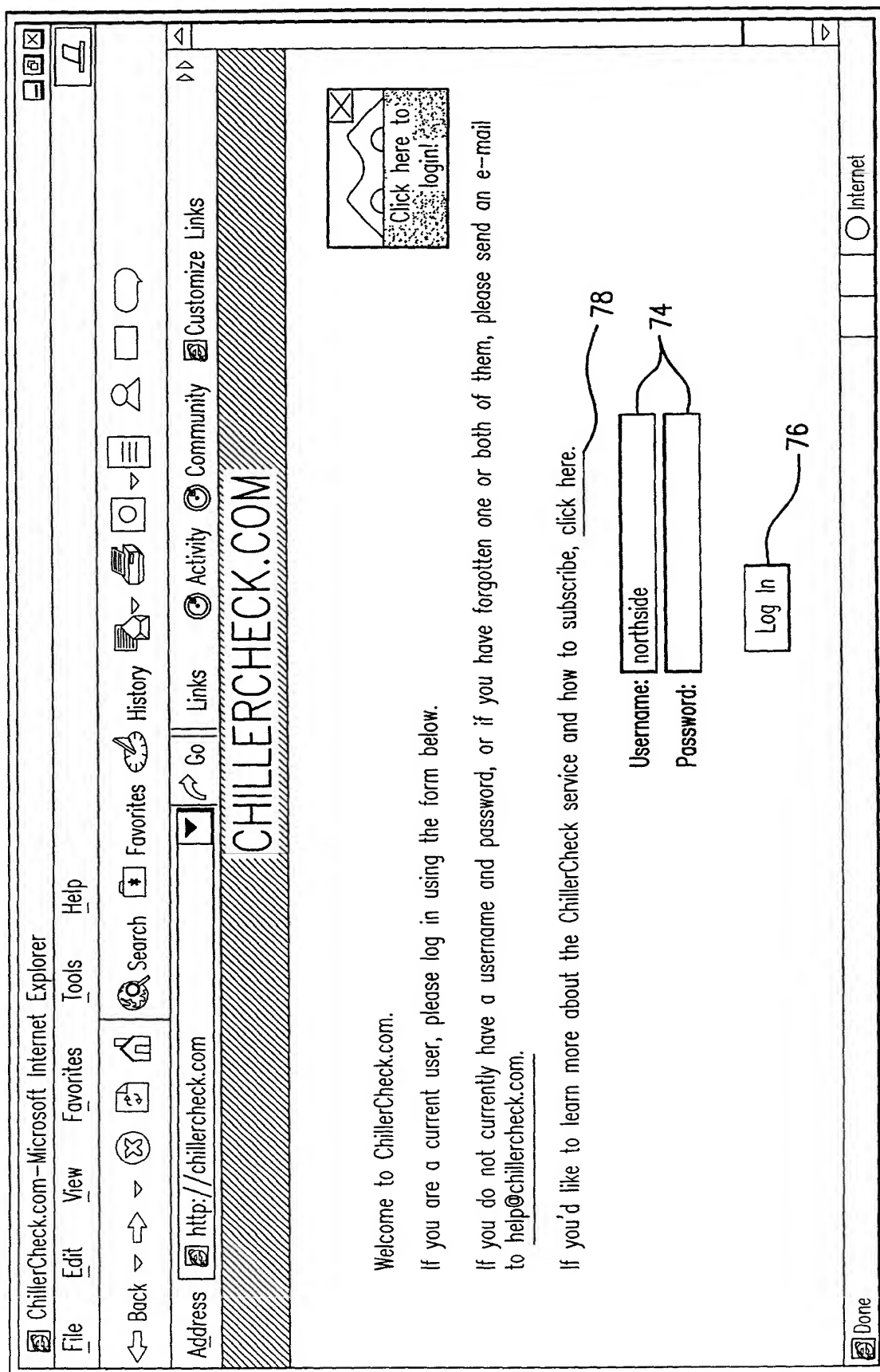
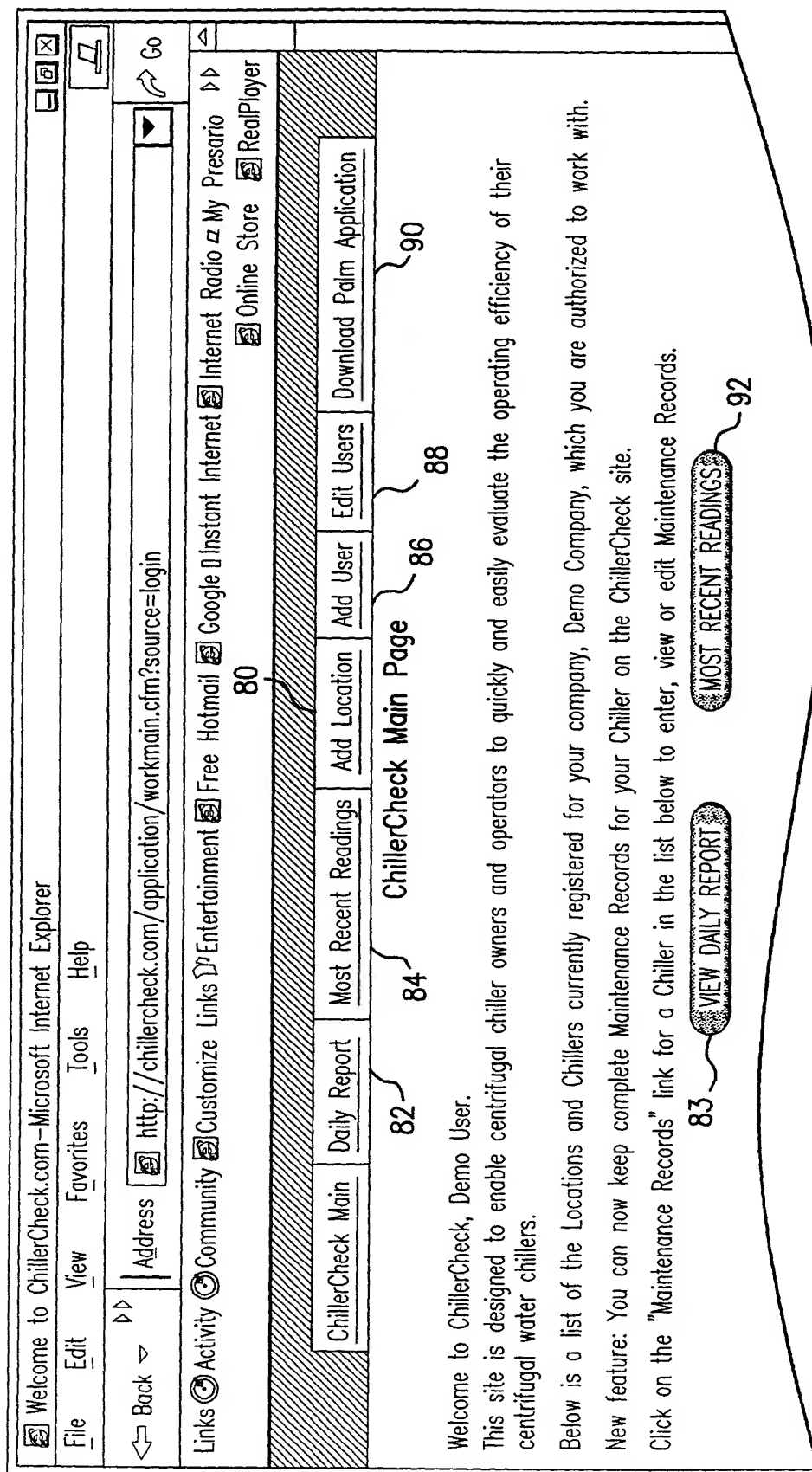


FIG. 4

204290" SEIGEL



CONT'D ON FIG.5-1

FIG.5

CONT'D FROM FIG. 5-1

Please click on the appropriate link to work with the information below.

If a red \* appears next to the Chiller #, some necessary information has not yet been set up for the chiller. Click on the "Alert" link to see details.

Admin Bldg.		160	162	167	156	152	158
Chiller #: 2	View Logsheet	Add Chiller to this Location	Maintenance Records	Edit Chiller Information	Delete this Location	Delete this Chiller	154
Central Plant		Add Chiller to this Location	Maintenance Records	Edit Chiller Information	Delete this Location	Delete this Chiller	158
Chiller #: 1	View Logsheet	Log Records	Maintenance Records	Edit Chiller Information	Delete this Location	Delete this Chiller	154
Chiller #: 2	View Logsheet	Log Records	Maintenance Records	Edit Chiller Information	Delete this Location	Delete this Chiller	158
		160	162	167	152	154	Internet

FIG. 5-1

# CHILLERCHECK.COM

ChillerCheck Main	Daily Report	Most Recent Readings	Add Location	Add User	Edit Users	Download Palm Application
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82      84      Add a Chiller at Atlanta Office Bldg.      86      88      90

Please fill in all information in the form below, then click the "Add Chiller" button.

You will then be taken back to the ChillerCheck Main page, where you can work with any of your Location, Chiller or Chiller Log records.

Note: If you do not have all the information below available at this time, you can still add the Chiller by filling out only the required information (marked with an \* below) now. You can come back later and add the rest of the information. However, you will not be able to make efficiency calculations or graph trends until all Chiller information has been recorded.

## Chiller Information

<b>Help!</b> * Chiller #:	<input type="text"/>	96
* Make:	Choose a Make ▾	98
<b>Help!</b> * Model:	<input type="text"/>	100
<b>Help!</b> Serial #:	<input type="text"/>	102
<b>Help!</b> * Refrigerant Type:	Choose a refrigerant ▾	104
<b>Help!</b> Year Chiller Was Manufactured:	Choose a year of manufacture ▾	106
<b>Help!</b> * Efficiency Rating (kw/ton):	<input type="text"/>	108
<b>Help!</b> * Energy Cost (\$/kw hour):	<input type="text"/>	110

FIG. 6A

10034785.062403

<b>Help!</b> * Weekly Hrs. of Operation:	<input type="text"/> ~ 112
<b>Help!</b> * Weeks Per Year of Operation:	<input type="text"/> ~ 114
<b>Help!</b> * Average Load Profile:	<input type="text"/> % ~ 116
<b>Help!</b> * Tons:	<input type="text"/> ~ 118
<b>Help!</b> * Design Voltage:	<input type="text"/> ~ 120
<b>Help!</b> * Full-Load Amperage:	<input type="text"/> ~ 122
<i>Now we need some information about the Condenser.</i>	
<b>Help!</b> Design Condenser Water Pressure Drop: (This value may be omitted if necessary, but your calculations will be more accurate if you have it. If you enter a value, you must choose a unit of measure.)	<input type="text"/> ~ 124 <input type="text" value="Choose a pressure unit"/> ~ 126
<b>Help!</b> Please choose a unit of measurement for the Actual Condenser Water Pressure Drop:	<input type="text" value="Choose a pressure unit"/> ~ 128
<b>Help!</b> Please choose a unit of measurement for Condenser Pressure:	<input type="text" value="Choose a pressure unit"/> ~ 130
Design Condenser Approach Temp: (This Value may be omitted if you do not have it.)	<input type="text"/> ~ 132

FIG. 6B

10034785-052402



*Now we need some information about the Evaporator.*

<p><b>Help!</b> Design          Chill Water          Pressure Drop:          (This value may be          omitted if necessary,          but your calculations          will be more accurate          if you have it. If you          enter a value, you          must choose a unit          of measure.)</p>	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; width: 100px; height: 20px;"></div> <div>Choose a pressure unit ▾</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span>134</span> <span>136</span> </div>
<p><b>Help!</b> Please          choose a unit of          measurement for          the Actual          Chill Water          Pressure Drop:</p>	<div style="display: flex; justify-content: space-between;"> <div>Choose a pressure unit ▾</div> <span>138</span> </div>
<p><b>Help!</b> Please          choose a unit of          measurement for          Evaporator          Pressure:</p>	<div style="display: flex; justify-content: space-between;"> <div>Choose a pressure unit ▾</div> <span>140</span> </div>
<p><b>Help!</b> Design          Evaporator          Approach Temp:          (This value may be          omitted if you do          not have it.)</p>	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; width: 100px; height: 20px;"></div> <span>142</span> </div>
<p><b>Help!</b> Evaporator          Design Outlet          Water Temp:</p>	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; width: 100px; height: 20px;"></div> <span>144</span> </div>
<p><i>Please choose a method of calculating Oil Pressure Differential for the Compressor.</i></p>	
<p><b>Help!</b> Calculate          Differential by:</p>	<div style="display: flex; justify-content: space-between;"> <div>Choose a method ▾</div> <span>146</span> </div>

FIG. 6C

*There are just a few more things we need to know about this chiller.*

Does the chiller have a readout for Purge Run Time?	<input type="radio"/> Yes <input type="radio"/> No 143
If so, is the Purge Run Time measured only in minutes, or in both hours and minutes?	<input type="radio"/> Minutes Only <input type="radio"/> Hours and Minutes 145
Please set a maximum amount of Purge Run Time per day you wish to allow before you are sent an alert.	<input type="text"/> Minutes 147
Does this chiller have a readout for Bearing Temperature?	<input type="radio"/> Yes <input type="radio"/> No 149
Operator Notes: (Enter any notes you might want to record about this chiller.)	<div style="border: 1px solid black; padding: 10px; min-height: 100px;"> <div style="text-align: right;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 100%;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-top: 5px;"></div> </div> </div> <div style="text-align: center; margin-top: 10px;">           150            148         </div>
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Add Chiller Info</div>	

FIG. 6D



204290" S34E007

CONT'D FROM FIG. 7

CONT'D FROM FIG. 7

Location: Main Chiller Plant Chiller #: 1												
8/24/01 TP	74.0	81.0	82.0	0.0	4.0	1.8	10.0	49.0	39.0	38.0	0.0	-16.0
9:08 AM												
Eff. Loss:												
10.8%												
% Load:												
57.9%												
Location: Main Chiller Plant Chiller #: 2												
8/21/01 TP	78.0	82.0	84.0	0.3	10.0	7.1	50.0	44.0	42.0	0.0	-12.0	
8:00 AM												
Eff. Loss:												
35.6%												
% Load:												
87.0%												
Location: Main Chiller Plant Chiller #: 3A												
8/21/01 TP	73.7	80.7	81.0	0.0	-0.5	-0.2	47.8	38.0	36.0	0.5	-8.8	
8:00 AM												
Eff. Loss:												
4.0%												
% Load:												
42.4%												
												Internet
												Done

FIG. 7-1



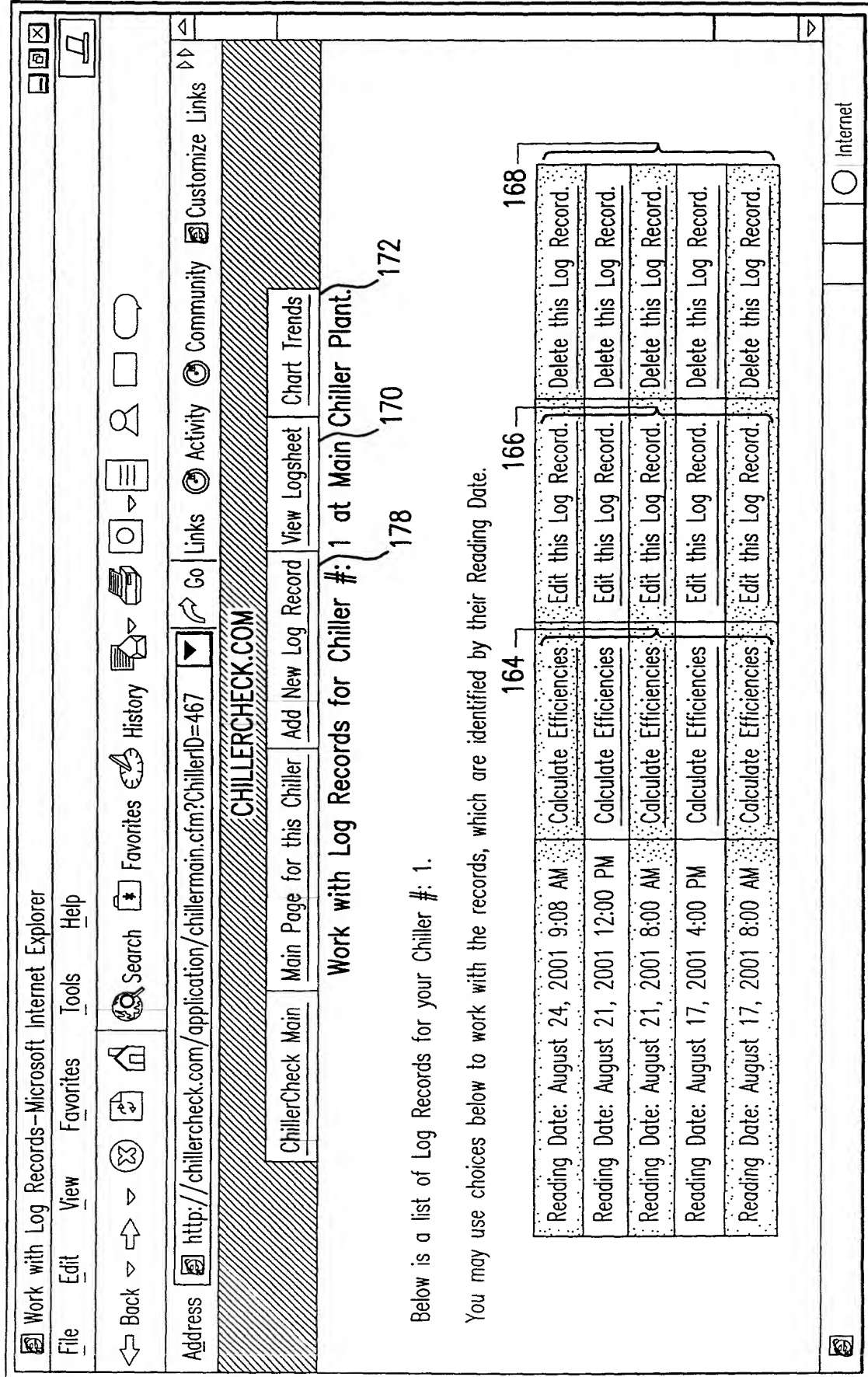


FIG. 9

204290" SHEET

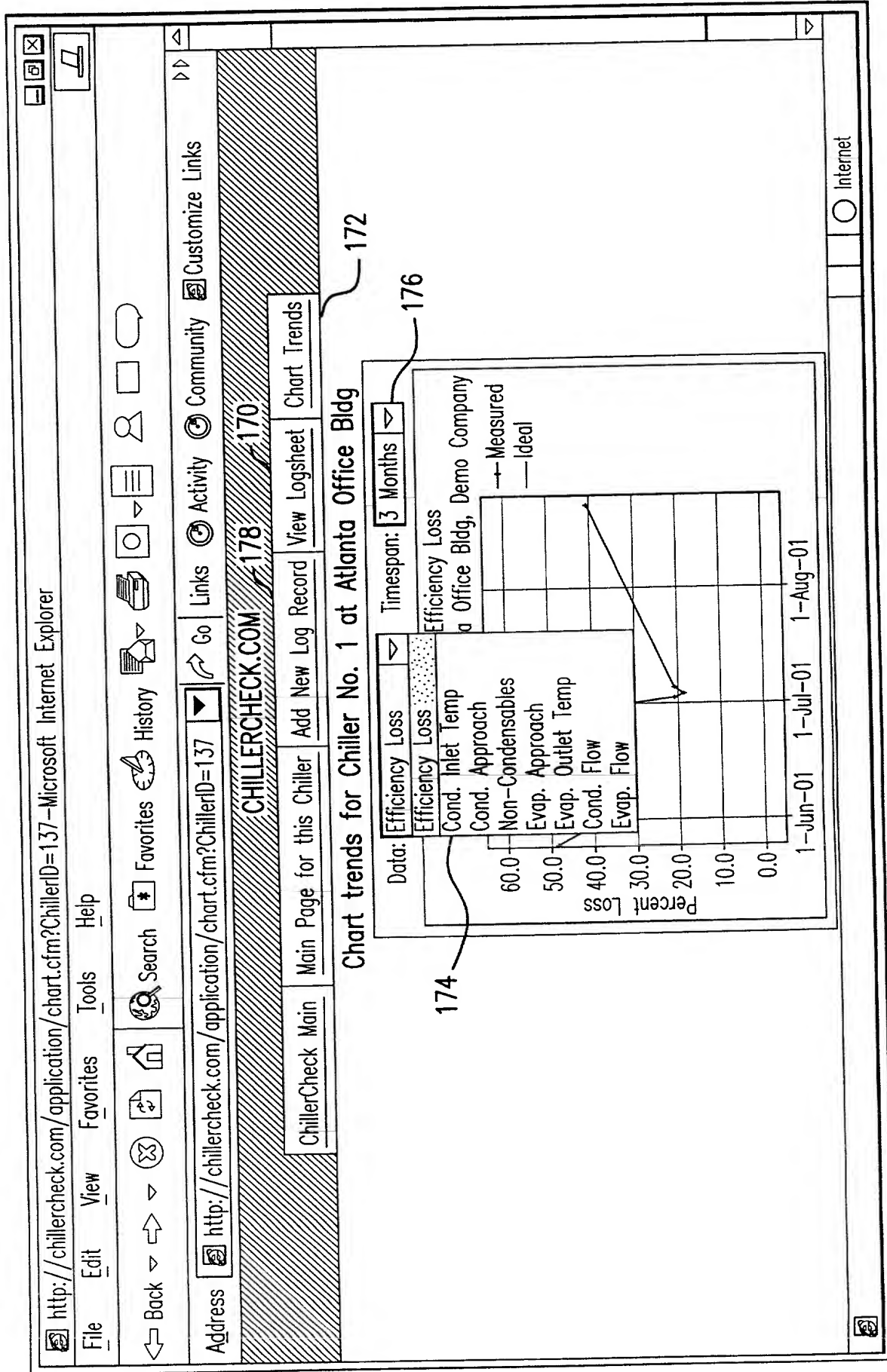


FIG.10



CHILLERCHECK.COM					170	172
ChillerCheck Main	Main Page for this Chiller	Add New Log Record	View Logsheets	Chart Trends		

Add a Log Record for Chiller #: 1 at Main Chiller Plant.  
 178

Please enter your readings into the form below, then click the "Add Record" button:

### Log Record

Operator:	Tim	
Reading Date:	August 24, 2001	180
Reading Time:	9:32 AM	182
<b>Condenser Readings</b>		
Inlet Water Temp:	<input type="text"/> °F	184
Outlet Water Temp:	<input type="text"/> °F	186
Refrigerant Temp:	<input type="text"/> °F	188
Condenser Pressure:	<input type="text"/> PSIG	190
Actual Condenser Water Pressure Drop:	<input type="text"/> PSIG	192
<b>Evaporator Readings</b>		
Inlet Water Temp:	<input type="text"/> °F	194
Outlet Water Temp:	<input type="text"/> °F	196
Refrigerant Temp:	<input type="text"/> °F	198
Evaporator Pressure:	<input type="text"/> In. Hg.	200
Actual Chill Water Pressure Drop:	<input type="text"/> PSIG	202

FIG. 11A

2004-08-24 10:45:00



204290 "5B4E001

<i>Compressor Readings</i>	
Oil Pressure (High):	<input type="text"/> lb. 204
Oil Sump Temp:	<input type="text"/> °F 206
Oil Level:	<input type="text"/> % 208
Bearing Temp:	<input type="text"/> °F 210
Run Hours:	<input type="text"/> 212
Purge Pumpout Time:	<input type="text"/> 214
<i>Electrical Readings</i>	
Amps Phase 1:	<input type="text"/> 216
Amps Phase 2:	<input type="text"/> 218
Amps Phase 3:	<input type="text"/> 220
Volts Phase 1:	<input type="text"/> 222
Volts Phase 2:	<input type="text"/> 224
Volts Phase 3:	<input type="text"/> 226
<i>Operator Notes</i>	
<div style="border: 1px solid black; padding: 10px; min-height: 100px;"> <p style="text-align: center;"><u>228</u></p> </div>	
<div style="border: 1px solid black; padding: 5px; text-align: center;"> Add Log Record 230 </div>	

FIG. 11B

CHILLERCHECK.COM

ChillerCheck Main
Chiller #1 Main Page
Maint. Records
Add Maint. Record
Add Log Record
View Logsheet
Chart Trends

Efficiency Calculation for Chiller #1 at Admin Bldg.  
 Reading taken on October 10, 2001 at 1:50 PM

163 Results 165

Target Cost to Run for Year	\$ 54,583
Actual Cost to Run for Year	\$ 65,993
Cost of Efficiency Loss	\$ 11,410
Efficiency Loss	20.9%

Detailed Cost of Efficiency Loss

Problem	Efficiency Loss	\$ Cost	Solution
Fouled Tubes - Condenser	9.5%	\$ 5,187	Fix it.
Non-condensables - Condenser	11.4%	\$ 6,222	Fix it.

Your Condenser Water Flow is 3.6% below design.

Your Evaporator Water Flow is 21.9% below design.

There is an electrical imbalance that may be decreasing the performance of your Chiller.  
 The voltage imbalance is 3.62%.

The % load at this reading time was 88.9%.

Back to the main page for this Chiller.

FIG. 12

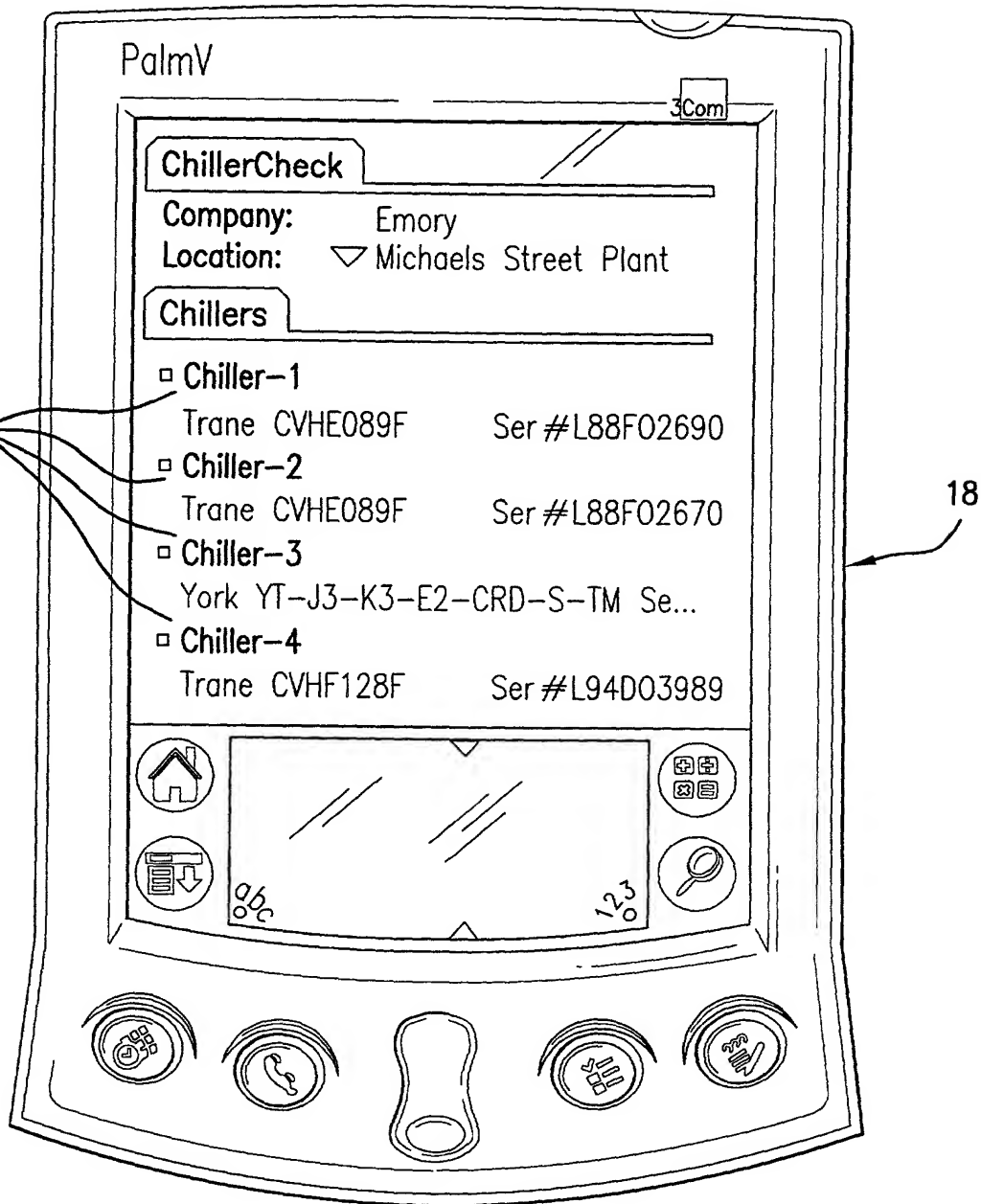


FIG.13

10034785-062402

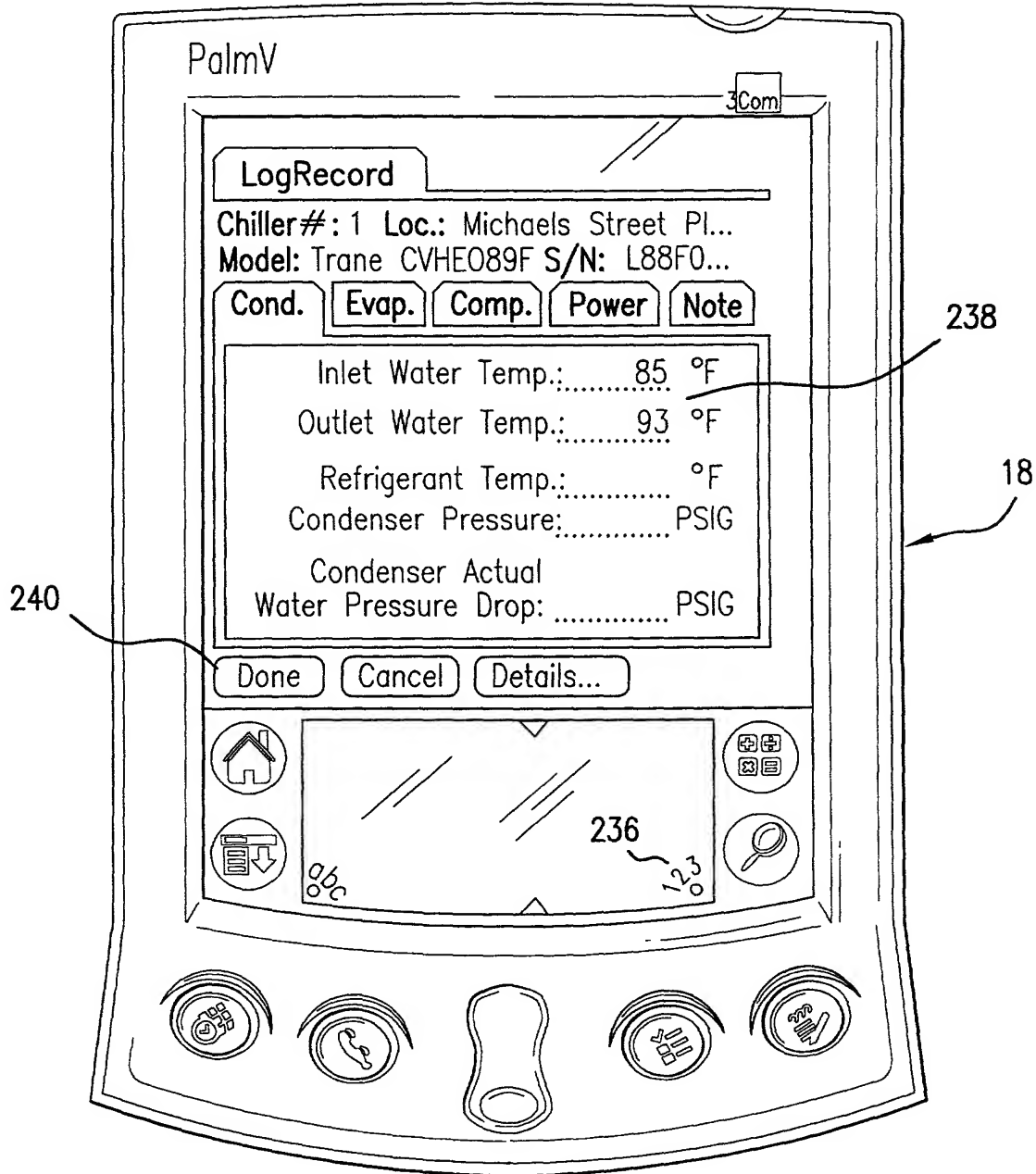


FIG. 14

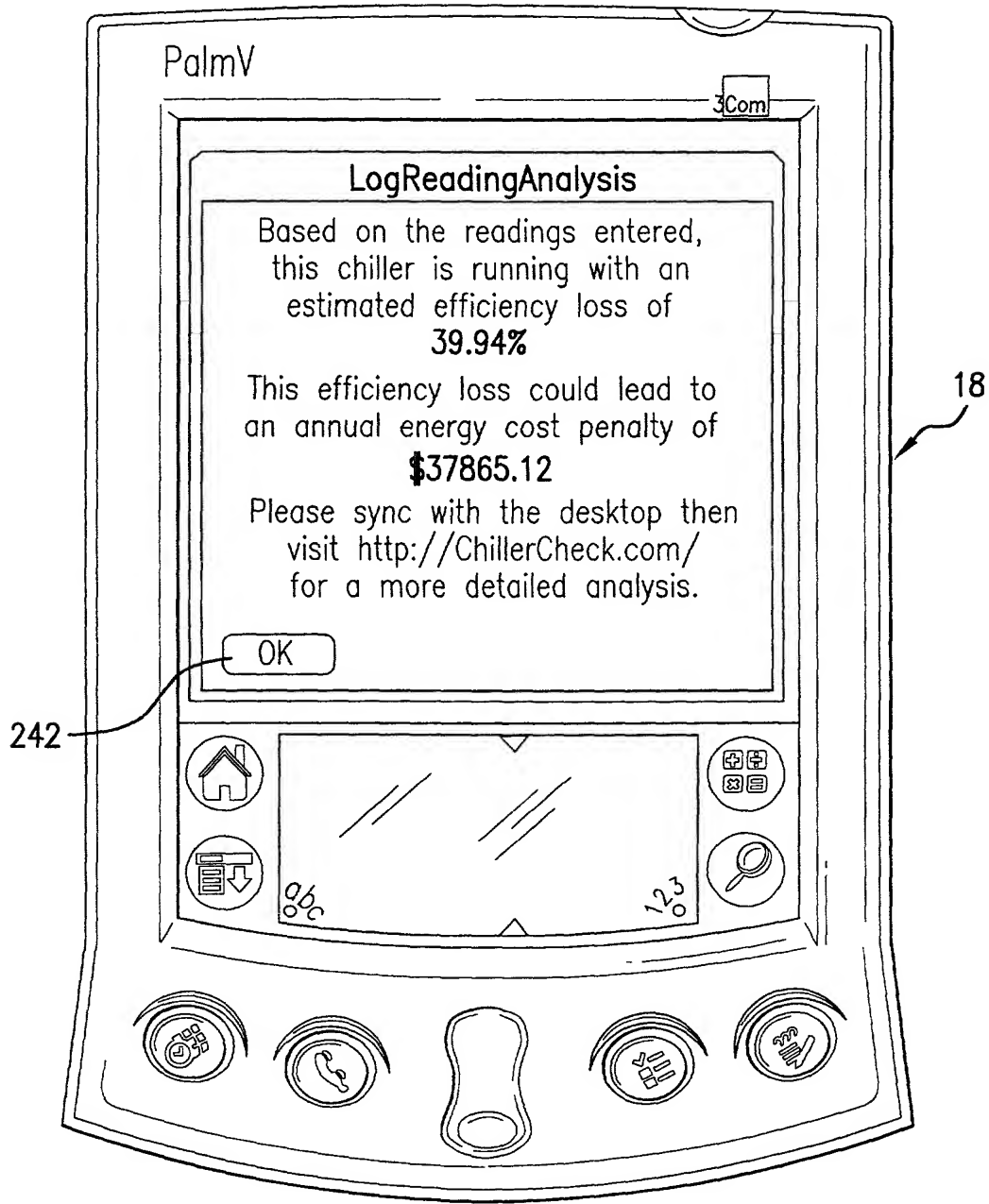


FIG. 15

10034785-062402

ChillerCheck Main	Chiller #1 Main Page	Maint. Records	Add Maint. Record	Add Log Record	View Logsheet	Chart Trends
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**Add Maintenance Record for Chiller #1 at Admin Bldg.**

Please fill in all information in the form below, then click the "Add Maintenance Record" button.  
 You will then be taken back to the Maintenance page for this chiller.

**Maintenance Information**

Annual Maintenance Date:	Select a Month	Day	Year
<b>Oil Maintenance</b>			
Oil Change Date:	Select a Month	Day	Year
Date Oil Added:	Select a Month	Day	Year
Quantity of Oil Added (Gallons):			
Oil Analysis Date:	Select a Month	Day	Year

CONT'D ON FIG.16A-1

**FIG. 16A**

CONT'D FROM FIG.16A

Eddy Current Tests	
Eddy Current Test Date (Condenser):	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Eddy Current Test Date (Evaporator):	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Major Stop Inspection (compressor teardown)	
Major Stop Inspection:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Refrigerant Maintenance	
Refrigerant Analysis Date:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Date Refrigerant Added:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Quantity of Refrigerant Added: (Pounds):	<input type="text"/>
Tube Cleaning	
Condenser Tube Cleaning Date:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Evaporator Tube Cleaning Date:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Purge Maintenance	
Purge Tank Reclaim Date:	<input type="text" value="Select a Month"/> <input type="text" value="Day"/> <input type="text" value="Year"/>
Purge Run Time Reading When Tank Reclaimed:	<input type="text"/>

CONT'D ON FIG.16B

FIG. 16A-1

10034785-1640

Inventor: Lawrence J. Seigel  
 Title: "METHOD AND SYSTEM FOR EVALUATING THE EFFICIENCY  
 OF AN AIR CONDITIONING APPARATUS"  
 Serial No.: 10/034,785  
 Docket No.: 03237.0001U2  
 Filing Date: December 27, 2001  
 Contact: Lawrence D. Maxwell, Esq. (404) 688-0770 Sheet 25 of 27

CONT'D FROM FIG.16A-1

Purge Filter Dryer Change Date:		Select a Month ▼	Day ▼	Year ▼
<b>Major Repairs</b>				
Major Repair Date:		Select a Month ▼	Day ▼	Year ▼
Major Repair Description:		<div style="border: 1px solid black; height: 100px; width: 100%;"></div>		
<b>Notes</b>				
Maintenance Notes: (You may enter a note about any type of maintenance):		<div style="border: 1px solid black; height: 100px; width: 100%;"></div>		
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Add Maintenance Record</div>				

FIG. 16B

204290 "534E001"



204290 "SEVENTH"

CHILLERCHECK.COM					178	170	172
ChillerCheck Main	Chiller #1 Main Page	Maint. Records	Add Maint. Record	Add Log Record	View Logsheet	Chart Trends	

### Maintenance Records for Chiller #: 1 at Admin Bldg.

Below is a list of the most recent Maintenance Operations for your Chiller #1. You may click on the name of a Maintenance Type to view all records of that type.

Maintenance Type	Most Recent Maintenance
Annual Maintenance:	October 18, 2001
Oil Maintenance	
Oil Change:	October 18, 2001
Oil Analysis:	October 1, 2001
Eddy Current Tests	
Condenser Eddy Current:	September 9, 2001
Evaporator Eddy Current:	September 10, 2001
Major Stop Inspection (compressor teardown)	
Major Stop:	January 3, 2000

CONT'D ON FIG.17-1

FIG.17

Inventor: Lawrence J. Seigel  
 Title: "METHOD AND SYSTEM FOR EVALUATING THE EFFICIENCY  
 OF AN AIR CONDITIONING APPARATUS"  
 Serial No.: 10/034,785  
 Docket No.: 03237 0001U2  
 Filing Date: December 27, 2001  
 Contact: Lawrence D. Maxwell, Esq. (404) 688-0770 Sheet 27 of 27

CONT'D FROM FIG.17

Refrigerant Maintenance	
<u>Refrigerant Analysis:</u>	January 3, 2000
<u>Refrigerant Added:</u>	August 23, 2001 – Quantity: 100 Pounds
Tube Cleaning	
<u>Condenser Tube Cleaning:</u>	October 19, 2001
<u>Evaporator Tube Cleaning:</u>	February 5, 2000
Purge Maintenance	
<u>Purge Tank Reclaim:</u>	February 7, 2001 – Purge Run Time at Change: 1212123
Major Repairs	
<u>Major Repair:</u>	April 4, 2000 Repair Description: motor burnout
Maintenance Notes	
<u>Notes:</u>	November 5, 2001 Note: starter problems resulted in burnout

FIG.17-1

204290-584007